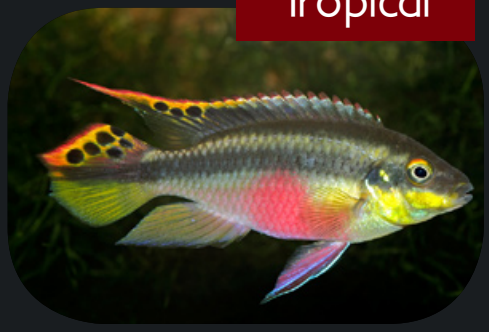
Redfish

Issue #3, September 2011

Photo by Jorgen Fischer Ravn

SPECIAL NANO ISSUE!

Tropical



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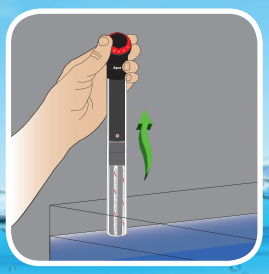

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Redfish contents

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This month's Eye Candy Contents Page Photos courtesy:

(Top row. Left to Right)
'Corals' by Wildxplorer
'Waterlily' by Christian Guthier
'Hyppocamp' by Semio
'Sky Aquarium at Rappongi Hills' by Matsuoka Kohei
'Under the Sea' by Mike Spasoff

(Bottom row. Left to Right)
'Ooooooooooo' by Laszlo Ilyes
'Self-Conscious Fish' by Michael Gil
'Maafushivaru' by nadia & massimo
'One of my Oscars' by Elma
'Tropical Fish' by Roger Green





About Redfish

Redfish is a free-to-read magazine
for fishkeeping enthusiasts.

At Redfish we believe in the free exchange of information to facilitate success by aquarium and pond hobbyists. Each month Redfish Magazine will bring you dedicated sections on tropical, coldwater, marine and ponds.

Redfish was founded in early 2011 by Jessica Drake, Nicole Sawyer, Julian Corlet and David Midgley.

We hope you enjoy this, the third issue of Redfish.

古池や蛙飛込む水の音
ふるいけやかわずとびこむみずのおと

Photo courtesy: (matt)

The Fine Print
Redfish Magazine

Letters & News

PREPARE TO BE MESMERIZED AS SHEDD BRINGS THE MYSTERIOUS WORLD OF SEA JELLIES TO CHICAGO IN A NEW MUST-SEE EXHIBIT

Shedd Aquarium Explores the Mysteries of "Jellies" in a Limited-Time Special Exhibit
Opening April 15, 2011 - May 28, 2012

CHICAGO, USA - Beginning April 15, Shedd Aquarium guests will be mesmerized by a new special exhibit showcasing pulsing, translucent sea jellies and their mystifying natural history. Jellies sponsored by Walgreens, will immerse guests in an underwater world of rarely seen animals that survive—and thrive—without bones, blood, or brains. From beautiful and translucent moon jellies, to unique and fascinating upside-down jellies, to a variety of intriguing and eerie sea nettles, guests will encounter more than 10 species of jellies throughout the new temporary special exhibit.

Photo by John G. Shedd Aquarium

"Sea jellies are one of the most misunderstood animals in the ocean. We're excited to bring this rare glimpse at these amazing creatures through this intimate and up-close experience," said Mark Schick, collection manager at Shedd Aquarium. "The highlight of Jellies is the wide variety of jelly species that guests will be able to see; however, the engaging exhibit will also offer educational interactives and programming that allow guests to experience a deep dive into the dark and mysterious world of jellies."

According to Schick, like sharks, many people fear jellies and the tourist tales of their renowned stings. However, Shedd's exhibit teaches visitors about what makes jellies so extraordinary and unique. "We hope to cultivate a sense of understanding and appreciation for these graceful animals."

In Jellies, guests "dive" into the deep and complicated world of sea jellies, learning how their simple bodies have allowed them to survive for millions of years. Among the educational experiences, guests will see how a jelly can devour enough food to double its weight each day, and learn how sea nettles hunt by trailing their long tentacles and frilly feeding arms covered with stinging cells that paralyze prey upon contact. The exhibit also includes a lifecycle exhibit, combining video and actual jellies in various stages of their lifecycle. Guests will even learn about the anatomy of jellies through illuminated features focusing on the most vital organs of their simple bodies. "This visual exhibit will be a feast for the eyes and the mind with larger-than-life images and models, spectacular video, and a variety of jellies on display," said Bryan Schuetze, Vice President of Planning and Design at Shedd.

Photo by John G. Shedd Aquarium

For 500 million years, the seemingly simple systems of sea jellies have helped the often still mysterious creatures thrive in the world's oceans. There are thousands of species of jellies in the world, with more being discovered every day! Throughout Jellies, guests will learn how jellies' bodies are 95% water and their feeding arms can grow up to 8 feet long; how drifting with the current, jellies travel thousands of miles; and how the tiniest jelly could nestle into a contact lens, while the largest couldn't squeeze into a minivan. Enter this mesmerizing world of jellies, where your hosts are these spectacular creatures—some beautiful, some mysterious, but every one of them fascinating.

Shedd Aquarium is supported by the people of Chicago and the State of Illinois. Shedd Aquarium is an accredited member of the Association of Zoos and Aquariums (AZA) and the Alliance of Marine Mammal Parks and Aquariums.

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Aqua One Arctic Chillers will, on average, reduce the water temperature within the aquarium by up to 7-8℃ below the ambient temperature outside the aquarium based on aquarium suitability recommendations.

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Aqua One ProSkim Protein Skimmers

The ProSkim is the latest series of Protein Skimmers developed by Aqua One for the easy and effective removal of organic waste from aquarium water.

The ProSkim has variable mounting options that allow for use in either in-sump or hang-on style placement and features simple to use controls to adjust output quickly and easily with minimal effort. The needle wheel impeller reduces the bubble size, creating a greater surface area for the collection of organic waste.

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Reader's Tanks

Planted Aquascape:
by Matthew Simmons

* Tank size: 49x28x28
* Light: 120w T5HO @ 8hrs/day
* Filtration: AquaOne Aquis Advance 550 w/
AquaticMagic Lily Pipes
* Co2: 2.6kg Co2 system @ 0.5bps via UpAqua Inline Atomizer
* Substrate: 4 spoons Turmaline BC, 4 spoons Penac P, 4 Spoons Penac W, 2L ADA PowerSand Special S, 3L ADA Amazonia I (normal), 3L ADA Amazonia II (powder)
* Fertilizer: DIY PMDD mix
* Flora: Hemianthus callitrichoides, Eleocharis parvulus, Bolbitis heudelotii, Vallisneria sp.
* Fauna: None, although contemplating getting SSS grade CBS/CRS shrimp

Photo by Matthew Simmons

Planted Aquascape:
by David Allen

My tank is called a 20 Tall here in the U.S - that is a 20 gallon (76 litre, 61 cm x 30 cm x 40.5 cm).

The tank is equipped with an Eheim Ecco filter using filter floss, Bio-Chem Zorb, and Eheim Ehfimech ceramic rings, and an Ebo Jager heater. It is illuminated by a single 55 watt fluorescent tube. The substrate is Schultz aquatic plant soil.

The tank is automatically dosed with CO2 using an American Marine Pinpoint pH controller. I have it set to maintain a pH of 7.2. The tap water has a pH of about 7.8 directly from the tap. I don t test hardness because I don t do anything to modify the hardness anyway.

I try to change 25% of the water each week. The tank has just a few fish - some cardinal tetras, platies, and a corydoras cat. Plants include red and green cryptocoryne, java fern and java moss, amazon swords, and a Madagascar lace plant.

Photo by David Allen

Coral Reefscape:
by Shantelle Blain

* 200 litre (55 gal) reef tank.
* Occupants: 1x Blue Tang, 2 x Black Ocellaris clown fish, 1x Red Corris Wrasse, 1x abalone, 1x starfish + inverts. Corals include Elegance Coral, Heliofungia plate coral, Ricordea & anemone.
* Skimmer/filter: Marysis 240 pro series
* 2x 3000 lph wave makers (only 1 on during the night).
* Octopus horizon 144w t5 lights. Blue tubes are run for an additional 1 hour before and after main lights (approx. 10 hours a day) and moonlights are left on during night.
* RO water: PSI-019B-D1 4 Stage Marine Reverse Osmosis Unit.

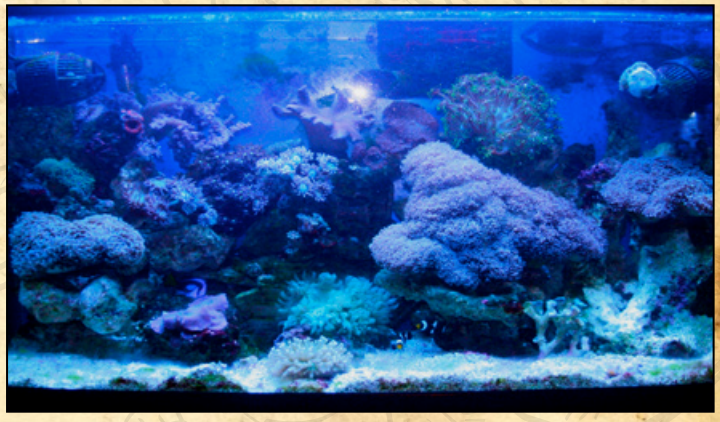

Photo by Shantelle Blain

I feed my fish Mysis shrimp soaked in Garlic and Nori and OCean Nutrition Foruma two marine pellets. The anemones are fed white fish and marine snow.

Got a great aquarium to share?
Email us a photo at:
enquiries@redfishmagazine.com.au

Siamese fighting fish

a betta guide to their keeping, by Lea Maddocks.

The beautiful ornamental fish *Betta splendens*, otherwise known as Siamese fighting fish, or simply 'betta', is arguably now almost equal to the goldfish in terms of popularity in the aquarium trade. Much of this popularity can be attributed to the stunning finnage of males and the seemingly limitless variety of colour combinations now available through extensive selected breeding. They also possess unique 'personalities', which many find endearing. The fact that bettas may be kept in smaller aquariums, and are relatively simple to care for make these fish an easy and rewarding species to own.

Photo by Daniella Vereeken

Sadly, mis-information regarding their native environment far too often doom many of these fish to a short life in unnecessarily small, unheated and unfiltered containers. Though domestic varieties are now far removed from their wild relatives, the requirements for a healthy betta remain largely the same. With an understanding of their true habitat, it is simple to provide a healthy aquarium which will truly showcase the beauty and persona of these fish.

Betta environment

The most common myth surrounding bettas are that these fish originate from, and prefer to live in, very small puddles. Many commercial betta kit homes use this to argue that a tiny space (often less than 2L) are ample space for a lone fish. Research on the wild habitat has shown this to be very far from the truth.

Photo by Daniella Vereeken

Habitat and the 'puddle' myth

The Betta genus encompasses a large number of species, mostly native to regions of Thailand, Cambodia and Vietnam, specifically the Mekong and Chao Phraya River drainage basins. The natural habitat of these fish are large, heavily vegetated marshes, rice paddies, large vegetated drainage ditches (klongs), and slow moving streams. These tropical ecosystems are shallow, though usually deeper than many aquaria, and very large in size. This provides ample space for large individual territories to be established, with some reports claiming that male bettas often possess territories of approximately 1 square meter.

During the dry seasons, however, considerable evaporation can leave these fish trapped in small quantities of water, which is the likely source of the 'puddle' myth. A hardy nature and ability to supplement oxygen from the surface allows bettas to survive for limited periods in these situations until they are able to escape to a larger body of water via their excellent jumping abilities. Water in these pockets is also generally refreshed as it is usually part of a larger body, and so waste is kept

to a minimum via dilution as well as absorption by the surrounding vegetation. Such refreshment is not available in tiny jars, where water will rapidly become toxic through the accumulation of waste. Additionally, small containers cannot maintain a constant tropical temperature, and as they cannot accommodate heaters this provides another source of stress to these fish.

the labyrinth organ

As the bettas native waters are thickly vegetated, slow moving, and even stagnant, they are commonly low in dissolved oxygen. To circumvent this problem, bettas posses a modified gill accessory organ, known as the 'labyrinth'. This organ arises from the foremost gill arch, and is greatly folded giving it a labyrinth-like appearance. The folds contain many tiny blood vessels, making it highly vascularized with a very large surface area, allowing oxygen to pass easily into the bloodstream from the atmosphere. This allows these fish to supplement their oxygen supply by taking occasional 'breaths' from the surface. The labyrinth is so efficient, that fish can actually use it for extended periods out of water while jumping between puddles searching for larger water sources during the dry season. In this case, desiccation actually poses a greater threat to survival. Several betta keepers (including myself) have witnessed this feat, having a betta escape/jump from its tank and being found sometimes hours later. After returning it to the aquarium, many fish prove not only to still be alive, but go on to make a full recovery.

The labyrinth organ is present in all species of the anabantoid family, which include gouramis and paradise fish. Though these fish can efficiently obtain oxygen from the air, it is only ever as a supplement. Contrary to some mis-information, these fish do require filters (or a large volume of regularly replenished fresh water) as reasonable oxygen levels as well as efficient biological and mechanical filtration are critical to maintaining good health.

the need for cover

Bettas originate in areas of thick vegetation, and substantial cover is essential for maintaining a health fish. They are territorial species, these fish require cover in which to hide, rest, explore, and defend. Bettas possess a noticeable intelligence and will become lethargic and deteriorate without this environmental enrichment.

Photo by Daniella Vereeken

Photo by Daniella Vereeken

Photo by Daniella Vereeken

Myths have abounded of bettas which 'freak out', hide and die prematurely when housed in large tanks, and were only happy in tiny containers. Most of these cases, once investigated, turn out to be a betta placed in a tank with limited cover (or were poorly acclimated). Given space to exercise and items to explore, they will feel secure enough to display their true colours - in terms of both their appearance and lively persona.

'Fighting Fish'?

Anecdotally it is said that these fish gained their name from the "Bettah" clan of ancient Asian warriors. These fish gained notoriety from their use in 'fish fighting', primarily in the region then known as Siam (now Thailand). However, these were not fights, but tests of bravery to see which fish would be first to retreat. Nipping was rare, with the loser swimming away after being flared at. Dominance displays and posturing usually occur over territory and females, and are over when a competing male retreats. In fact, betta males will only ever usually fight to the death if they are in a confined space or if they are a particularly aggressive individual. Still, these fish are considered to have an aggressive temperament, and males should under no circumstances be housed together. However, a single peaceful individual can make a wonderful addition to a community tank in the right setting (see Tankmates).

Photo by Daniella Vereeken

In the home aquarium

Given their native conditions, the ideal aquaria for a single betta (male or female) is:

- Aquarium of 15L or above with a lid to prevent jumping. Space must be available between the water and tank lid in which to take in air.
- Filter with adjustable flow. HOB (hang on back) or powerheads on low setting are recommended as this mimics their natural habitat, and males with ornate finnage are weak swimmers.
- Submersible heater set between 24 and 28°C.
- High quality betta pellets and other high protein freeze-dried, frozen or live foods fed in very small amounts. Bite size pieces of cooked and skinned pea can be offered weekly to aid digestion, as bettas have short guts and are prone to intestinal blockages.

Photo by Daniella Vereeken

- Cover of approx 30% or higher in the form of live or silk plants. Additional enrichment can be added such as ping-pong balls, hamster tubes, caves (ceramic cups and terracotta pots work well) or other smooth decorations. All items including substrate must be smooth to prevent tears in delicate fins. Most plastic items are best avoided.

Tank mates

Betta personalities are as variable as their coloring, and while one male may cohabit peacefully with other species, another may set out to destroy any other fish and/or invertebrates and claim the tank

for themselves. In small aquariums, aquatic snails or small shrimp may be housed with a betta though a back up plan is advised in case the betta becomes aggressive and/or tries to eat them. For a community tank, aquariums are recommended to be lightly stocked, heavily planted (real or silk plants), and in excess of 40L so that individual territories are able to be established, with an extra 20L recommended for a large shoal or each additional small shoal of another species. This will reduce chances of aggression and/or stress.

Aquarium and photo by Lea Maddocks

Compatible tankmates are peaceful species which are not liable to challenge the betta, nip long fins, or swim in the top strata where bettas patrol and males build their bubblenests. The best species are small catfish such as *Otocinclus* or *Corydora* spp. In larger aquariums, small, peaceful shoaling species may co-habit provided large shoals are kept to provide security and prevent fin nipping behaviours. Compatible shoaling fish include White Cloud Mountain Minnows, small rasboras (*Trigonostigma* or *Boraras* spp.), small peaceful tetras such as Ember, Glowlight, Neon etc, and peaceful barbs like Cherry Barbs. Even when following these recommendations, a betta community may fail and a backup tank for the betta is strongly advised in case aggression, fin nipping, or stress in either species occurs. Aggressive species, species with colourful fins, or fish otherwise resembling male bettas are to be avoided. Only one male betta should ever be kept per tank, and males should not be mixed with females unless breeding. Several females can be kept together in a sorority, though a large, under stocked, and densely planted tank is advised, with a backup tank available to house any aggressors.

Conclusions

Betta splendens are an interesting, lively, low maintenance and beautiful ornamental fish. When provided with a basic cycled, filtered, heated, and planted aquarium large enough to exercise and show off their unique personalities, they will be an enjoyable and impressive addition to any hobbyists collection.

Acknowledgements

This article includes a number of beatiful Betta photos from the photostream of Daniella Vereeken. We recommend you visit her flickr site! http://www.flickr.com/photos/betta-online/

Lea Maddocks has been a long-time fish enthusiast, SCUBA diving since age 15. A biologist (BSc, Hons, MPhil), Lea has developed a fascination with aquarium science. Lea now operates a hobby business in aquarium assistance and maintenance; supplies her own fin-safe betta ornaments; contributes to several fish forums; and has written for the RSPCA on the nitrogen cycle, goldfish and betta care following significant research. Lea owns three planted tanks, two accommodating bettas, and routinely maintains several freshwater tanks, a turtle tank, and a marine reef.

Tropical freshwater community

Great selections for your new nano!

Photo by Budi Lukman

The fish and invert choices for the freshwater tropical nano are many and varied. Here we assume you want plants in your aquarium, some fishes choices, however, are incompatible with plants (mostly small Lake Tanganyikan cichlids) - but we'll save their discussion for another day...

So what are good choices for the "casually" planted community tropical aquarium? Here we highlight some of our favourites!

Tetras

Tetras are all part of the Characidae, a family of fish that includes the fearsome Piranha! Clearly a fish that's not suitable for the nano aquarium. Most, but all species are South American in origin, hailing from the Amazon Basin and its tributaries. There are some African species (such as Congo Tetras), though these too are a little large for the nano aquarium.

Small tetras, however, make fantastic choices for the nano aquarium. Amongst the common options available: Neons, Cardinals, Glowlights, Penguins, Rummynose and Silvertip Tetras - all make excellent additions to these kinds of aquariums. Some of the mid-sized species, such as Serpae Tetras (*Hyphessobrycon eques*) can have the odd individual that is particularly nippy.

As a general rule with tetras, most species do better in small groups. They don't school tightly like some cyprinids - but they appreciate the company of their own kind nevertheless.

Some tetras can be a little more demanding than other species - primarily due to their origins in the blackwater habitats of the amazon. If you've got particularly hard, alkaline water in your municipal water, tetras may not be the best choices.

Rummynose Tetra (*Hemigrammus rhodostomus*)

The iconic Cardinal Tetra (*Paracheirodon axelrodi*) Photo by Axel Rouvin

Silver-tip tetras can be a little nippy. (*Hasemania nana*)

Cyprinids

Cyprinids are a particularly diverse group of fishes that include goldfish, barbs, rasboras, danios, headstanders and the various "sharks". Being such a diverse group of species, there is a plethora of excellent choices to the nano aquarium.

It's worth noting up front that goldfish aren't good choices for the tropical nano aquarium. Good mid-water swimming choices from this group include: White Mountain Cloud Minnows, danios, Cherry Barbs and Harlequin Rasboras. Of these, Cherry Barbs are happy in small groups (pairs), but most of the other species mentioned above benefit from being kept in a small school of 6-8 individuals. Some species, like

Harlequin Rasboras (*Trigonostigma heteromorpha*) are an excellent choice for the nano aquarium

Harlequins (pictured above) are tight schoolers and won't do well in the absence of a little community.

Fishes from this group also include some excellent selections for algae control: most notably Siamese Algae Eaters (*Crossocheilus siamensis*) and the Sucking Loach (*Gyrinocheilus aymonieri*). Both these species grow too large for the nano aquarium - but are ideal when small, so we'd recommend returning them to your local aquarium and obtaining smaller stock once they reach lengths of 7-8cm.

Small sucking loaches are ideal algae eaters, though they grow too large for long term housing

Cherry Barbs - Photo by Budi Lukman

Trigonostigma espei is a colourful relative of the Harlequin Rasbora. Photo by Budi Lukman

Killifishes

Killifish is a rather arbitrary term for any egg laying cyprinodontiform fish (a group that includes families Aplocheilidae, Cyprinodontidae, Fundulidae, Nothobranchiidae, Profundulidae, Rivulidae and Valenciidae). Being a large group (with over 1000 species), they are a pretty diverse group of fishes, however, some killifish make excellent choices for the nano aquarium. The one downside, however, is that killifish can be reasonably hard to obtain as many aquariums don't stock a great range of species. Many *Aphyosemion* species are ideal as they are small growing and relatively peaceful. If you're having trouble finding killis and have your heart set on them - your best bet may be to join your local killi association.

Due to their smaller size, many *Aphyosemion* species are ideal for the nano aquarium.

Cichlids

Many cichlids make poor choices for the small, lightly planted aquarium. There are, however, exceptions to every rule. Dwarf cichlids from South America and West Africa make ideal additions to the nano aquarium, they are relatively peaceful, interesting fishes with advanced brood care and fascinating behaviour.

Some species do dig a little, particularly if not provided with some cover. For the cave spawning species failure to provide a spawning site (an inverted terracotta pot or similar) can cause more digging. In my opinion, the best choices are probably kribensis and their allies in the genus *Pelvicachromis*, along with both species of rams (Bolivian and Blue). In the less frequently available category: *Nannacara anomala* and *Anomalochromis thomasii* are truly superb fishes for the nano aquarium - but can be difficult to source. All *Apistogramma* and *Dicrossus* species are also suitable, however, they can be tricky and are best kept only by experienced hobbyists. Within the genus *Pelvicachromis*, a few species are typically available through retailers, though *P. pulcher* (the common kribensis) is undoubtedly the hardiest. An albino form of this species is available, though in the authors opinion the natural form is more striking.

Breeding cichlids can be challenging in the nano aquarium - pairs can and will spawn in small aquariums and may then become more aggressive.

Their relatively peaceful nature, fascinating behaviour and striking colours make *Pelvicachromis* spp. ideal for the nano aquarium.

While peaceful and perfectly sized, Rams (*Mikrogeophagus ramirezi*) tend to be delicate fish, Bolivian Rams (below) may be a hardier choice.

Though less brightly coloured, the Bolivian Ram (*Mikrogeophagus altispinosus*) is a hardier Ram. Photo by úlfhams_víkingur.

Catfishes

By far the best choice for catfish in the nano aquarium are fishes from the genus *Corydoras*. Cory catfish are hardy, attractively patterned schooling fishes who use their down-pointing barbels to seek food amongst the gravel. This constant rummaging through the gravel is reminscent (to me at least) of a flock of chickens, pecking at the ground.

Suckermouth catfish (family Loricariidae) can be shy residents of the aquarium. This is *Panaque maccus* (L104 or LDA22). Photo by Budi Lukman.

Corydoras panda is commonly available, and beautiful. They need company of their own kind. Photo by OsaMu.

Corydoras trilineatus is often mistakenly sold as *Corydoras julii*.

Corydoras sterbai featured in Issue #1 of Redfish http://www.redfishmagazine.com.au/editions

Commonly available species such as the Bronze and Peppered Corydoras are excellent for new fishkeepers, while intermediately experienced aquarists may like to try their hand with something more exotic. Try *Corydoras trilineatus* (sometimes erroneously sold as '*Corydoras julii*' - the latter being relatively difficult to source). Other great choices include *Corydoras panda*, *Corydoras habrosus*, *Corydoras schwartzi* or the beautiful dwarf Corys: *Corydoras hastatus* and *Corydoras pygmaeus* if you're after something different in this group of fishes.

Smaller suckermouthed species, such as bristlenose catfishes (*Ancistrus* spp.) and *Otocinclus* spp., are also good choices - and have the added benefit of providing some algae control.

Labyrinth fishes

There's a nice discussion of Bettas in Lea Maddocks's article on the species in this issue of Redfish, so we direct interested readers to this resource on the Siamese Fighting Fish.

Bettas aren't, however, the only labyrinth fishes that are good choices for the nano freshwater aquarium. Beautiful, though less frequently seen options include the delightful Honey Gourami (*Trichogaster chuna*) along with the somewhat tricky-to-keep Chocolate Gourami (*Sphaerichthys osphromenoides*). Other suitable species include Sparkling Gourami (*Trichopsis pumila*) and Croaking Gourami (*Trichopsis vittata*) though both species can be a little fussy and require at least a modicum of experience with fishkeeping before they should be attempted.

We'd recommend avoiding the Dwarf Gourami (*Colisa lalia*) unless you can find high-quality locally bred stock. For reasons that are unclear, many individuals of this species are in poor health and aren't hardy. Paradise fish are a relatively easy-to-keep, cooler water (16-26 °C / 61-79 °F) species. Males are aggressive towards other males, and can be harsh on other tankmates so care should be taken when adding other species.

Like cichlids, some labyrinth fishes can be a little boisterous, particularly if breeding, so keep an eye out for undesirable behaviour. It's also worth noting that most species in this group prefer relatively slowing moving water with dense, top-level plant cover.

The Honey Gourami (pictured is the gold form), is an excellent choice for the smaller aquarium. Photo by Budi Lukman.

Conclusions

Readers should note that this isn't an exhaustive list of suitable fishes, it simply highlights our favourites. The nano aquarium can be a vibrant environment and there is a host of excellent species that are suitable. As always, a little research prior to purchase and avoiding spontaneous new acquisitions, for which you're underprepared, is the secret to nano success.

Redfish Magazine PhotoContest 2011

Redfish Magazine Photo Contest. July - September 2011

Redfish Magazine is pleased to announce the first of its quarterly Aquarium Photo Contests for 2011-2012. Each month we'll publish our favourite reader submitted aquatic-related photos, and in October 2011, we'll announce the winners for this round.

The subject must be aquatic-related, though it's not limited to aquariums or ponds.

This quarter we are pleased to be able to offer an AquaOne Tropical Starter Kit as a prize! Many thanks to AquaOne for supplying the prize.

CODEWORD: NANO

Entering the photo contest

Entering the photo contest is simple.
Email your name, the codeword, postal address and a high res. version of your photo to competitions@redfishmagazine.com.au.

Please check the rules and regulations prior to entry.
"Waiting for Separation" by Hamid Najafi.

Rules and Regulations

Photo must be your own work. Post processing of your own images is allowed. You must be over 18 years of age to enter the competition.

Detailed rules and regulations are available at:
www.redfishmagazine.com.au/competitions/2011_photo_comp_1
"Untitled" by D. Sharon Pruitt.

Need Inspiration?

Here are some amazing aquatic images!

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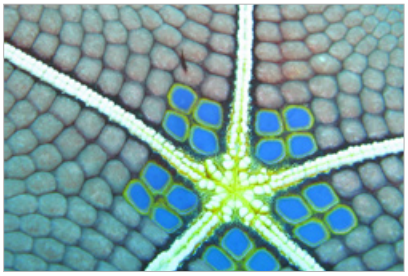

"Starfish Shrinp on a Cushion Seastar" by Tanaka Juuyoh

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brain coral
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our favourite reader photos!

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TECHNICALLY NANO

SMALL AQUARIUMS, PARTICULARLY NANO-SIZED AQUARIUMS POSE SEVERAL CHALLENGES INHERENT TO THEIR LIMITED VOLUME. OVERCOMING THESE CHALLENGES ISN'T IMPOSSIBLE, BUT IT'S IMPORTANT TO BE AWARE OF THE POTENTIAL PITFALLS AND CONSEQUENCES OF THE LOSS OF SIZE.

HEATING

Heating smaller aquariums is typically more tricky than heating large aquariums. There's two reasons for this: the first is a physical property of being small, i.e. a large surface area to volume ratio, while the second is aesthetic, heaters are bulky items that take up a reasonable amount of room in a smaller aquarium. Let's consider the first.

PHOTO BY BUDI LUKMAN

Surface area to volume

Smaller objects have a larger surface area to volume ratio than larger objects. This has an effect on how quickly an object exchanges heat. A small aquarium thus loses – and gains – heat to (and from) the environment at a much greater rate than a larger aquarium. In unheated systems, this property means that the variance in temperature during a given time period is greater for smaller aquariums.

For example, a poorly insulated home in Sydney might range in September from 10° C in the cool of night to 22° C in the heat of the day (50-71.6° F). That 12° range in temperature wont manifest itself completely in an aquarium because the water has some reasonable ability to retain heat, and glass is a relatively poor conductor of heat – but the smaller the aquarium, the greater the range that will be experienced. This is a very serious problem for extremely small (under 8 litre, 2 gallon) unheated goldfish bowls and the primary reason that goldfish bowls should be a reasonable size and not placed near windows where these extremes are likely to be even greater.

In the heated tropical nano, this is less of a problem – as most heaters (but not all) have a thermostat, however, if you live in a particularly hot climate overheating (and resultant fish deaths) is much more common in smaller aquariums. Nano-sized aquariums take on heat much more readily than larger aquariums – and short of using a chiller there's little you can do to reduce the temperature. Thus if you live in a very warm climate that frequently has maximum temperatures over 35° C (95° F), you will need to ensure that you have somewhere cool to house your nano, alternatively, consider larger aquariums with their correspondingly larger thermal mass.

Aesthetics

Most heaters are reasonably elongate and somewhat bulky. This means they can consume a reasonable amount of real estate in the nano aquarium. There are some smaller, paddle-like aquariums on the market, however, the aquarist should be aware that some of these items don't have a thermostat. Such heaters are "always on" and as such they can be fairly inaccurate – and if too large a capacity heater is used, they can kill your fish by overheating the aquarium. In my opinion, this is a risk that's not worth taking, especially if you're new to fishkeeping. Instead, I'd recommend the use of a thermostat-controlled, adjustable heater. There are numerous brands that offer reasonably small sized (25W) heaters. Clever aquascaping can be used to obscure the heater in the aquarium. If you're distressed by the idea of a heater (and

FUTURISTIC VECTORS COURTESY: HTTP://WWW.RETICULA.FR/

the filter) ruining the zen beauty of your nano - there's always the option to sneakily plumb your nano into a large volume sump, hidden discretely in the stand or in a cupboard below the nano display. I won't tell anyone.

FILTRATION

There's no reason other than aesthetics that nano aquariums should be harder to filter than larger aquariums. That said, aesthetics are important to most people and while a large air-driven sponge filter right in the centre of your nano aquarium will perform admirably it's not something most fishkeepers want to install. Why? Well, without mincing words, it's ugly and is best consigned to the fishrooms of serious hobbyists - where aesthetics aren't a primary aim.

Thankfully there are a few good options for filtering the tropical freshwater nano that are both effective and reasonably tidy. Some all-in-one nano aquariums, like those made by AquaOne, include a filter in the "hood" of the aquarium with the lights. This keeps the aquarium uncluttered and means that most of the technical gadgetry (heater aside) is hidden away. Two other commonly used options are small, impeller-driven sponge filters (such as the picture to right) and hang-on-the back filters. The former have advantages where there's limited room around the aquarium and the latter can be customised to include alternative filter media. It's important that the flow rates in the aquarium aren't extreme, unless you're keeping fish from rapids! Finally, there's always the sump option I mentioned above.

LIGHTING

Lighting the tropical freshwater nano has never been easier and there is a host of products on the market to suit your setup. These include standard fluorescent lighting, high ouput T5 lighting (for planted nanos) and even LED, the latter are particularly attractive due to their low heat output and energy efficiency. In the last few months I've seen some rather lovely, articulated lamp-like products for suspending your LEDs over your nano. LEDs have the added bonus (when used as spots) of creating some beautiful ripple effects in the water.

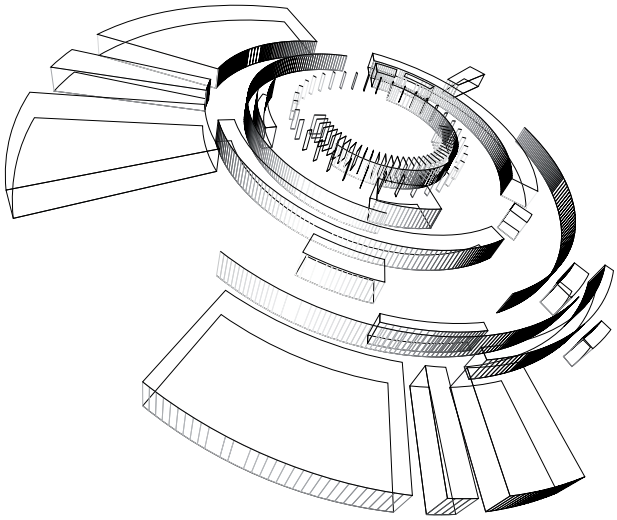
WATER CHANGES

As for virtually all aquariums, water changes are part of ownership. Their frequency varies by stocking and plant density, however, in a normal situation changing 20% of the water fortnightly is fairly standard. Obviously, densely planted aquariums, with few animals require less frequent water changes. It's worth pointing out that water changing in a nano aquarium is generally easier than in a larger aquarium – as the volumes to be changed are generally small. This means it's easy to get lured into doing large water changes at reduced frequency. I'd recommend you avoid that temptation. Large percentage (over 50%) water changes (done infrequently) tend to result in very rapid changes in water chemistry which are stressful (and can be fatal!). These should only really be undertaken when something dire is happening in the aquarium.

FINAL THOUGHTS

Keeping a small aquarium isn't always easier than keeping a large aquarium. In fact, in most aspects, successfully maintaining a smaller aquarium is significantly more difficult. Beginners should be particularly cautious – as somewhat counter intuitively – small problems can be greatly magnified in very small aquariums (particularly in those aquaria under 10 litres).

For most nanos (ie: those, greater than 10 litres and less than 60 litres in volume) make a plan and stick to it - you'll have success!



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Fish choices for the nano REEF AQUARIUM

by Aaron Sewell

The decision to keep a nano aquarium places very obvious limitations on the choices of fish that will be available to keep. However, there are plenty of choices when it comes to selecting fish for a small marine aquarium. In fact there are some fish that make ideal candidates for the nano aquarium that would otherwise be overlooked or even lost in a larger aquarium. This article will outline a selection of the main types of fish that are well suited for this type of aquarium.

Firstly, to clarify the definition of a nano aquarium. Different people have different ideas as to what constitutes a nano aquarium and many criteria have been used. It has been suggested that any aquarium up to 24" long is a nano, this would make a 24" cube (220L) a nano and I would suggest this is really pushing the definition. Probably the most popular definition is anything up to 30 US gallons, close enough to 120L. References to nano aquariums in this article will adhere to this general definition.

Gobies (family Gobiidae)

The most logical place to start is the family of fish that possesses the smallest known species of bony fish. With over 1500 species worldwide which are found in freshwater, marine and brackish environments, gobies can be found in just about every corner of the reef. Not only are there a huge variety of gobies which are small, they are also bottom dwelling fish that tend to restrict themselves to movement over a very small territory.

Some, such as the coral gobies (*Gobiodon* and *Paragobiodon* spp.) will happily live within a single head of Acropora or other similar coral. In fact, they are so reluctant to leave their home, it is not uncommon for these corals to be collected from the reef and sent to retailers with live gobies still inside. Other gobies such as the Crab Eye Goby (*Signigobius biocellatus*) and the various shrimp/watchman gobies (Amblyeleotris, Cryptocentrus and Stonogobiops spp.) as well as

Yellow Watchman Goby. Photo by Erica Breetoe

the sleeper gobies (*Valenciennia* spp.) all live in borrows that they spend most of the day guarding. All but the latter group of these are ideally suited to nano aquariums. Most gobies are carnivorous with few reports of some such as the Rainford Goby, *Amblygobius rainfordi*, being omnivorous. They generally feed on zooplankton, though the acceptance of prepared foods varies greatly between species.

Blennies (family Blenniidae)

Blennies are a closely related family to the gobies and like gobies, they are a family of generally small fish that restrict their movements to

a Lawnmower Blenny

the Red Sea Mimic Blenny (*Ecsenius gravieri*) is sometimes available in the aquarium trade.

fairly small areas. Unlike gobies, there are many species, including most that are commonly available to aquarists, which are herbivores. This makes them perfect for the nano aquarium as not only are they some of the most entertaining personalities but they also provide a service for the aquarium in their grazing of nuisance turf algae.

Some of the more popular species including Bicolour Blennies (*Ecsenius bicolor*), Midas Blennies (*E. midas*), Redstreak Blennies (*Cirripectes stigmaticus*) and Lawnmower Blennies (*Salarias fasciatus*) fit the description above very well and make ideal additions to large or small marine aquariums. On the other hand, the fang blennies of the genus *Meiacanthus* are carnivorous and generally feed on the flesh and scales of larger fish. In the aquarium

the purple firefish, *Nemateleotris decora*

they willingly take most prepared meaty foods and don't tend to bother other similarly sized fish. Also, unlike most of the herbivorous blenny species or comb toothed blennies, fang blennies are not substrate dwelling fish and will swim throughout the aquarium. Both comb toothed and fang toothed blennies can make excellent additions to a nano aquarium though some will become territorial so it is best to avoid mixing them with fish that will compete for the same space within the aquarium.

Dartfishes (family Ptereleotridae)

Formerly part of the wormfish family (Microdesmidae) and before that part of the goby family, dartfish are some of the most ideal fish for nano aquariums. Again, close relatives of gobies, dartfish are slender, bottom to mid level dwelling, carnivorous fish. They tend to take very well to captive life and willingly accept most prepared foods offered. They are extremely docile though they can show aggression towards conspecifics. The most common and most suitable fish in the family are the firefish of the genus *Nemateleotris* which reach sizes of only around 7-8cm. The other common members of the family are the genus *Ptereleotris* which generally reach around 10cm. While all can be kept individually, the latter will fare well in small groups and therefore are better suited to slightly larger aquariums, though large nano aquariums of around 90-120L are suitable.

this large coldwater Australian species, the Eastern Blue Devil, is related to the longfins but is not commonly available and too large for the nano reef.
Photo by Taso Viglas

Longfins (family Plesiopidae)

While very few members of the longfin family are available to aquarists, there are a few notable members that make excellent additions to a nano aquarium. The most well known member of the family is the Comet Grouper (*Calloplesiops altive-*

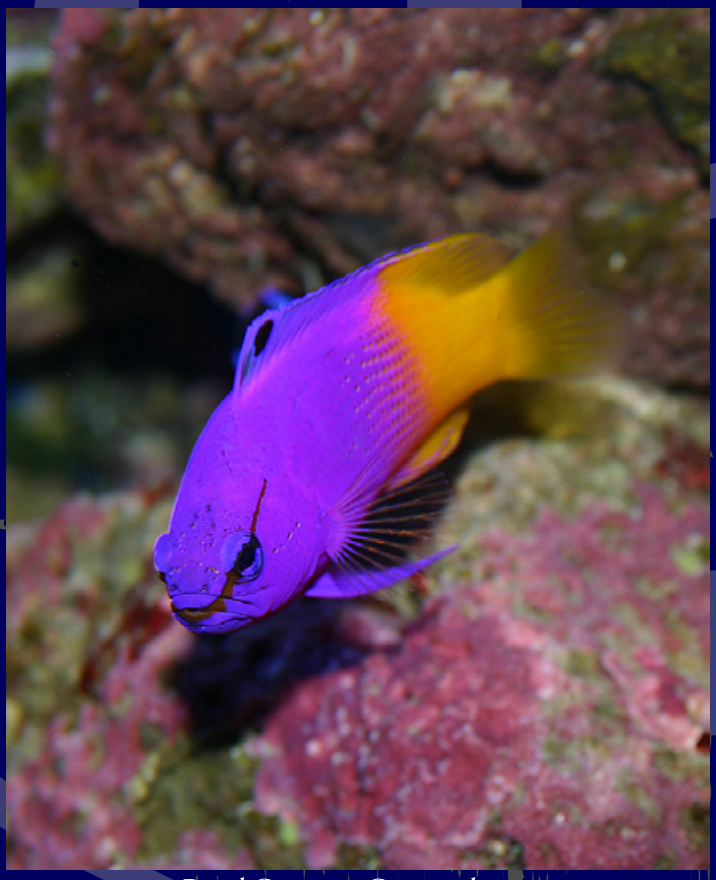
lis) which reaches a maximum size of around 16cm so may not be ideal for nano aquariums, though many of its smaller relatives fit the bill perfectly. The most notable of these are the Yellow and Blue Assessors (*Assessor flavissimus* and *A. macneilli*), which reach only 6cm and are very peaceful fish. These fish live in shoals of anywhere from 10 to several hundred individuals and their social interactions can be entertaining to watch. A large nano could reasonably house a small group of these fish which should be offered a rock ledge. Occasionally members of the genus *Plesiops* will be offered to aquarists, these species generally reach around 7-8cm. Unlike assessors, they tend to be solitary fish, however ,they are equally suited to nano aquariums.

Grammas (family Grammatidae)

Despite being a small family of fish with just a few representatives available to aquarists and even fewer available in Australia, grammas are a very popular group of fish, especially amongst nano enthusiasts. The most well known is the Royal Gramma (*Gramma loreto*) but the Brazilian Gramma (*G. braziliensis*) and the Black-cap Basslet (*G. Melacara*) are also occasionally available.

Generally, grammas are peaceful fish that will get along well with other small fish, however, they may not be as well suited to cohabitating with small ornamental shrimp as they have been known to attack and even consume small shrimp. There are also suggestions that the Brazilian Gramma may be more aggressive towards tankmates than Royal Grammas and there can be confusion with identification between the 2 species because they appear to be almost identical. They can be identified due to a distinct line that runs diagonally across the eye of the Royal Gramma that is absent in the Brazilian Gramma. In the Australian trade, grammas can command high prices compared to other small fish due to their origins in and around the Caribbean but they tend to be extremely hardy fish.

the Magenta dottyback, *Pseudochromis porphyreus*, is sometimes available
Photo by Brian Gratwicke



Royal Gramma, *Gramma loreto*

Dottybacks (family Pseuchromidae)

It is rare to walk into an aquarium store these days where marine fish are being sold and not see a dottyback on offer. They make ideal fish for beginners right through to enthusiasts and most that are offered to aquarists are ideal for nano aquariums.

The more commonly available species include the Royal Dottyback (*Pseudochromis paccagnellae*), Diadema Dottyback (*P. diadema*) and the Orchid Dottyback (*P. fridmani*). Dottybacks are

Cocoa damselfish (*Stegastes variabilis*)

Clownfish are part of the damselfish family.
Photo by Samuel Chow

notoriously aggressive fish so you should be careful when deciding what tankmates to mix them with, especially given the lack of space to ascertain territories in a nano aquarium, and shrimp should be avoided, even those substantially larger than the dottyback. Suitable tankmates include suitably sized blennies, wrasses and damselfishes.

Damselfishes (family Pomacentridae)

Like dottybacks, damselfish are one of the staples of marine aquarium retailers. A wide range of species are commonly available and usually very reasonably priced. Also, like dottybacks, they are known for their aggression. The family includes clownfish (subfamily Amphiprioninae) which tend to be on the less aggressive end of the spectrum but still can be quite territorial.

What makes damselfish so appealing is their brilliant colours and their confidence, they are not the kind of fish that hides all day behind the rockwork. They can be mixed with other fish of the same family and in a nano aquarium are best mixed with wrasses, dottybacks and suitably sized blennies or gobies.

the beautiful Mandarin Dragonet (*Synchiropus splendidus*)

Dragonets (family Callionymidae)

While dragonets are generally small, peaceful and secretive fish, attributes that would make them ideal additions to a nano aquarium, they are also highly specific in their diets which can make them difficult to keep in a small aquarium. Only a few species of dragonet are commonly available in the trade, specifically the Mandarin Dragonets (*Synchiropus splendidus* and *S. picturatus*) as well as the Scooter Blenny (*S. ocellatus*), but all 3 species are very popular fish.

Dragonets spend most of their time foraging on sandy substrate where they feed on zooplankton such

the Twospot Cardinalfish (*Apogon pseudomaculatus*) is a beautiful species, but not always available.

as copepods. It is occasionally possible to wean these fish onto a diet of prepared foods such as frozen brine or mysis shrimp, most often they will only accept live foods and even then it may be limited to live copepods. It is possible to supply this as a daily feed but it is more ideal to provide a substantial refugium that will maintain a population of live copepods that are constantly moving into the display aquarium where they will be consumed by the dragonet. In an aquarium without such facilities, it is important that these fish are not mixed with other species that will compete directly for food such as small wrasses.

Cardinalfishes (family Apogonidae)

Banggai Cardinals (*Pterapogon kauderni*) and Pyjama Cardinals (*Sphaeramia nematoptera*) have long been commonly available to aquarists but in recent years some of the less well known cardinalfish, especially those from the genus *Apogon*, have become more accessible to aquarists. What makes cardinalfish so ideally suited to nano aquariums is their size, which for most of the commonly available species is between 5-10cm, as well as their behaviours. Cardinalfish are possibly some of the most peaceful fish available to aquarists and they are also not very active, generally hanging around rock ledges where in nature they would be taking advantage of the passing currents and picking at passing zooplankton. In the aquarium they will readily accept anything from flake foods to frozen meaty foods very willingly.

Wrasses (family Labridae)

Wrasses are a large family of fish that can range

the Six-line Wrasse is a small species, reaching only 7cm
Photo by Brian Gratwicke

Banggai Cardinalfish

from just a few centimetres in length to over a meter. There are a relatively small number that are suitable for nano aquariums but some of those are extremely colourful and interesting fish. One of the most ideal is the Six Line Wrasse (*Pseudocheilinus hexataenia*), a small wrasse that reaches around 7cm and is a very peaceful fish compared to many of its larger relatives. There are also the flasher and fairy wrasse (*Paracheilinus* and *Cirrhilabrus* spp.) and the possum wrasses (*Wetmorella* spp.) which are small, peaceful fish that suit aquariums under 100L. All these fish feed on zooplankton though most will accept prepared foods, especially frozen meaty foods such as brine or mysis shrimp.

Seahorses and pipefish (family Sygnathidae)

Seahorses are a group of fish that have probably had more books dedicated to them than any other single family of marine fishes. They are an immensely popular family of fish that require care unlike most other aquarium fish. With so many captive bred species available, keeping seahorses is not seen as the great

Seahorses are great choices for the small aquarium, but require specialist care.

challenge that it was in years gone by but it still poses some difficulties when compared to other fish species. Fortunately, wild caught seahorses are rarely seen in the trade as commercial breeding has taken over. This means that most that are offered to aquarists will feed on frozen brine or mysis shrimp. Pipefish on the other hand are less commonly captive bred and there are still many wild caught specimens found in the trade. Seahorses and pipefish fare well in aquariums that are relatively dimly lit and have less than average amounts of water flow. The care of some of the closely related families such as the seamoths (Pegasidae) and ghost-pipefish (Solenostomidae) is fairly similar though these fish are less commonly available to aquarists.

Pipefishes are sometimes available, but like seahorses require a higher level of experience with reefing.

Conclusions

There are a huge variety of fish available that are suitable for nano aquariums, many of which are often overlooked by the average aquarist due to their size. Often the lack of size is made up for with extremely interesting behaviours and social interactions. In a nano aquarium, fish selection can be more important because the aquarium may house just 1 or 2 fish and you want to make sure you get the choice right. In many cases choosing just 1 fish can be ideal, with a fish that is particularly unusual that you may not be able to keep in an aquarium housing more species. Some of the smaller species of anglerfish (*Antennariidae*) or scorpionfish (*Scorpaenidae*) can be ideal in this kind of aquarium.

When considering fish for a nano aquarium, always consider the maximum size of the species rather than just the size the fish is at the time of purchase. Also consider the behaviour of the fish, a slightly larger fish that is largely inactive (such as a seahorse or anglerfish) might be a more ideal selection than a smaller fish that is more active (such as an anthias).

Aaron Sewell

In 2004 Aaron completed a BSc (Marine Science) at the University of Sydney with majors in marine biology and tropical marine science. Since 2001 he has been involved with the aquarium industry at hobbyist and retail level and now works in aquarium product development. Aaron is a former committee member of the Marine Aquarium Society of Sydney and has collected fish and corals in Fiji for the US and European aquarium industries. Aaron has been writing for several local and international aquarium magazines since 2004.

Community Noticeboard

ADVANCED AQUARIST
http://www.advancedaquarist.com/

ACE - Australian Cichlid Enthusiasts
http://www.aceforums.com.au

Australia New Guinea Fishes Association (ANGFA)
http://www.angfa.org.au

New South Wales

Koi Society of Australia
> Coffs Harbour
Meets 14:00, last Sun. each month. 7-9 Prince St. Bellingen.
> Newcastle
Meets 19:00, 1st Tue. each month. P: 4959 6000
> Central coast
Meets 11:00, 1st Sun. each month. Watanobbi Community Centre, Watanobbi.
> Northern Sydney
Meets 20:00, 2nd Wed. each month. West Pymble Memoric Hall, West Pymble.
> Cumberland
http://ksacumberland.webs.com
Meets 19:30, 3rd Wed. each month. Brennan Park Hall, Smithfield.
> Macarthur
Meets 19:30, 4th Mon. each month. Currans Hill Community Hall, Currans Hill.
> Illawarra
Meets 19:00, 4th Tue. each month. Flinders Community Hall, Flinders.
> Southern NSW
P: 02 4454 0194

Marine Aquarium Society of Sydney
http://www.masa.asn.au/mass/
e: mass@masa.asn.au

New South Wales Cichlid Society (NSWCS)
http://www.nswcs.org.au/
Meets 19:30, 1st Sat. each month, Nuwarra Public School, Moorebank.

New South Wales Cichlid Society (NSWCS) - Illawarra.
Meets 19:30, 2nd Sun. each month, Kanahooka High School, Kanahooka.

ACT

Canberra and Districts Aquarium Society (CDAS)
http://drupal.cdas.org.au/
Meets 19:30, 3rd Tue. each month. Harmonie German Club, Narrabundah.

Canberra Killifish Study Group (CKSG)
http://drupal.cdas.org.au/content/killi-corner

Australian Koi Association
http://www.akakoi.com

South Australia

South Australian Aquarium Society Inc.
http://aquariums.2om.com/

South Australian Native Fish Association
www.sanfa.org.au
sanfa@bold.net.au

Western Australia

Marine Aquarium Society of WA
www.masa.asn.au/maswa/
maswa@masa.asn.au
phone:
Chris Sutton
0419 858 108

Perth Cichlid Society
www.perthcichlid.com.au

Koi Society of WA
www.koiclubwa.com
Meets 19:30, 4th Wed. each month, Rotary Hall, South Perth.

Victoria

AQUARIUM SOCIETY OF VICTORIA
HTTP://ASOFV.COM.AU/

Marine Aquarium Society of Victoria (MASOV)
http://ozreef.org/masov.html
e: dbw@ozreef.org

Eastern Districts Aquarium Society
http://www.edas.com.au/
Meets 4th Fri. each month, Willis Rm, Council Offices Nunawading.

EDAS plant study group
http://www.edaspsg.org/

Victorian Cichlid Society (VCS)
http://home.vicnet.net.au/~cichlid/
Meets 19:30, 1st Wed., The Oakleigh Centre, Oakleigh.

Queensland

MARINE AQUARIUM SOCIETY OF REGIONAL QUEENSLAND
http://www.masrq.org
e: info@masrq.org

MARINE AQUARIUM SOCIETY OF QUEENSLAND
http://www.masa.asn.au/masq.php
e: info@masq.ws
P: 07 3261 8582

ANGFA Qld
http://www.angfaqld.org.au

GOLD COAST AQUARIUM SOCIETY (GCAS)
HTTP://WWW.GCAS.NET.AU

Aquarium and Terrarium Society of Queensland
http://www.aandtsociety.org.au
E: aandtsociety@gmail.com

Marine/Reef Aquarium Society
http://www.aandtsociety.org.au
E: aandtsociety@gmail.com

Queensland Cichlid Group
http://www.qcichlid.org
Meets 20:00, 1st Fri. each month. Bar Jai Hall, Clayfield.

Brisbane Aquatic Plant Study Group
http://bpsg.frell.org/

Tasmania

Tasmanian Aquarium Society

Hobart Cichlid Society
www.tassiecichlids.com

Wide Bay Aquarium Society
wbaqs.com.au/forum/index.php

New Zealand

Federation of New Zealand Aquatic Societies
http://www.fnzas.org.nz/

Internet

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The Nano Reef

by Sara Allyn Mavinkurve

...nano aquariums are difficult to maintain. If you are to be successful, you will have to be dedicated and determined, research the desired live stock and create a thoughtful plan ahead of setting up the system.

'Cardinal Column' Photo by John Ciotti - http://www.flickr.com/photos/jciotti/

The first time I heard the term "nano reef" I was looking at a <40 litre glass aquarium on the counter at a local aquarium store. Being the incurable geek that I am, I immediately pondered the literal implication and the technical accuracy of the term "nano reef."

The term "nano," in general, means "one billionth" of something. I thought to myself "*what's one billionth of a reef*?"

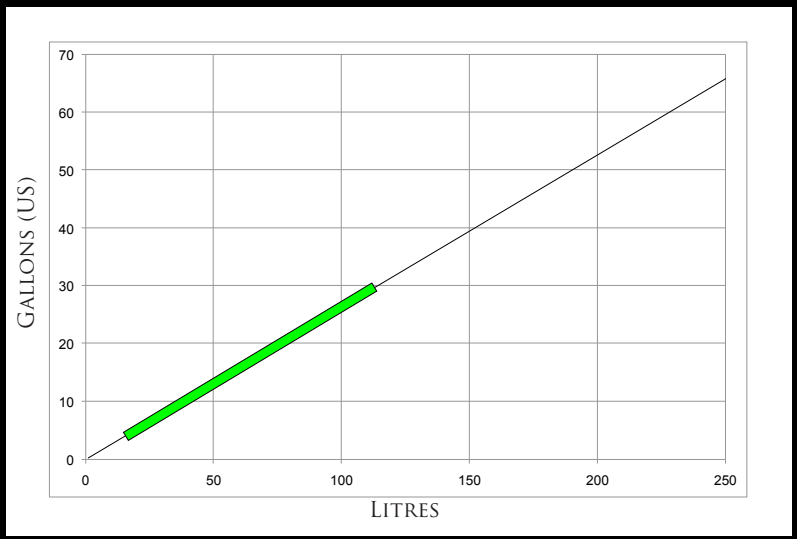
Queensland's iconic Heart Reef. Photo by Marlène Bougard

How big is a reef? I went to Wikipedia to get some data on the actual size of the thousands of individual reefs along the collective set of Australian costal reefs known as The Great Barrier Reef.

I estimated the average area of one reef, within The Great Barrier Reef, to be approximately 120 square kilometres, or 120,000,000 square metres. The average depth of any given reef is maybe ~50 metres. One-hundred and twenty million square metres multiplied by an estimated average depth of 50 metres yields 6 billion cubic metres.

And this is how I came up with the idea that one nano reef (1/billionth) is approximately, on average, give-or-take 6 cubic metres. That's 6,000 litres of water! So what do you call a 40 litre reef aquarium? The term "pico" means one trillionth. One trillionth of the average reef would be only 6 litres. That's too small to describe what most aquarists call "nano reef" aquariums, which are probably closer to 60 liters. Sadly, I was unable to find a single term to describe ten x one trillionth, or one hundred-millionth of something. But then I did what all reef aquarists do when there's no known term for something they want to describe: I made one up! Since "deka" means "times ten," I've decided to refer to all erroneously labeled "nano" reef aquariums as "deka pico" reef aquariums. You can laugh, but "refugium" isn't a real word either.

If you're still reading this article, you must be very interested in deka pico reef aquariums. That's important. I had to test you. Deka pico aquariums are very difficult to maintain. If you are to be successful, you will have to be dedicated and determined. Having the resolve to read through almost 300 words of geeky rambling about the term "nano reef" is a good start, but you'll also have to research the desired live stock and create a thoughtful plan ahead of setting up the system.



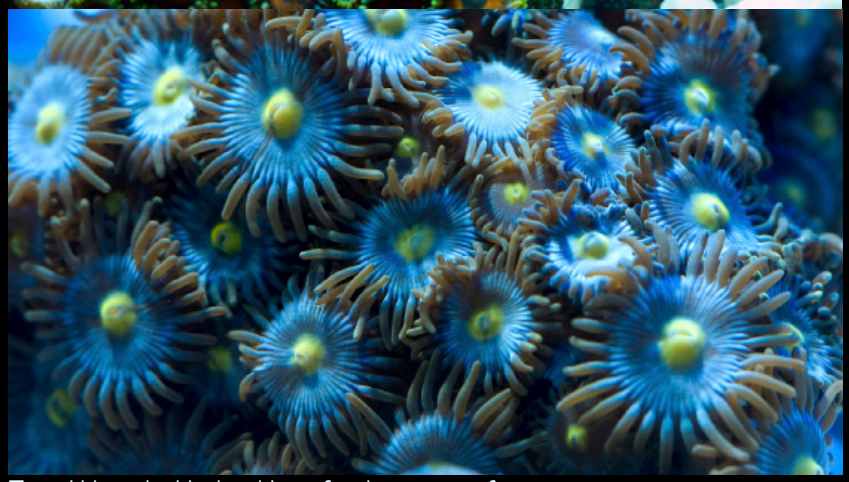
The relationship between litres (x) and US gallons (y). The green bar highlights the range of volumes considered by most aquarists to be 'nano' reefs.

Setting Up Your Aquarium

Aquarium size

You should pick the size of your deka pico based on 1) how you plan to maintain the system, and 2) what you want to keep in the system. Most deka pico aquariums range in size from 20L to 100L (approx. 5-25 gallon). However, sometimes there's more to the story than the part of the system that is actually displayed. I once saw a system which consisted of a 30L (8 gallon) display tank with a connected

100L (25 gallon) refugium hidden beneath it. You might think that's cheating and I might agree with you. However, cheating or not, it's a much easier system to maintain. The general rule is that the larger the water volume of the system, the more forgiving the system will be, and the easier it will be to maintain. This is true of any reef aquarium. There's an exception to this general rule when your primary method of maintenance is frequent large water changes. Changing 50% of the water in a 20L (~5 gallon) aquarium is obviously a lot easier than changing 50% of the water in a 200L (~50 gallon) aquarium. This reminds me of another way to "cheat" with deka pico reef aquariums. If you already have an average to large sized well established and healthy reef aquarium system, you can maintain a 20L (~5 gallon) deka pico aquarium on your coffee table by simply doing daily water exchanges between your main system and your table-top system using one of those large plastic cups you can get at a service (gas) station.



Zoanthids make ideal residents for the nano reef

If you don't have another reef aquarium system, you should get a large plastic barrel (such as a Rubbermaid trash bin) where you can "age" water for water changes. Fill the bin with mixed salt water of the desired salinity.

Keep the bin covered but not sealed, and keep the water circulating with a power head. Also, it probably doesn't hurt to add a little "old water" to the new water. Ideally, you should have a constant supply of "aged" salt water for water changes. Newly mixed salt water is ok. However, the smaller the system and the larger the water changes, the more of a shock the water changes is going to cause. Doing water changes with aged water lessons that shock. This is particularly important if your maintenance plan involves frequent water changes.

Filtration

If you don't want to do 50% water changes twice a week, you will have to use some sort of filter with your deka pico reef. If you plan to keep your bioload low, you might be able to use an ordinary, hang-on-back filter. Rather than discuss all the suggested possibilities, I've put together the following chart of suggestions.

VOLUME	OK	BETTER	BEST
< 20 litres (<5 gallon)	50% WC with well aged water, 4 to 5 times a week	2x weekly 25% WC & quality sponge filter	2x weekly 25% WC & quality mini-filter
20 - 40 litres (5 - 10 gallon)	25% WC with well aged water, 4 to 5 times a week or weekly 25% WC & quality sponge filter	Weekly 25% WC & quality hanging filter (rated for 10g) + live rock (from an established system)	Connection to a larger system
40 - 80 litres (10 - 20 gallon)	Weekly 25% WC with well aged water + sponge filter + live rock (from an established system)	Weekly 25% WC & quality hanging filter (rated for 20g) & live rock (from an established system)	2x monthly 25% WC & canister filter (properly maintained with activated carbon) & live rock (from an established system) OR Connection to a larger system
80 - 120 litres (20 - 30 gallon)	2x monthly 25% WC +canister filter (properly maintained with activated carbon) + live rock (from an established system)	2x monthly 25% WC & canister filter (properly maintained with activated carbon) & live rock (from an established system) & protein skimmer	2x monthly 25% WC. Sump filter & live rock (from an established system) & protein skimmer

WC = Water changes

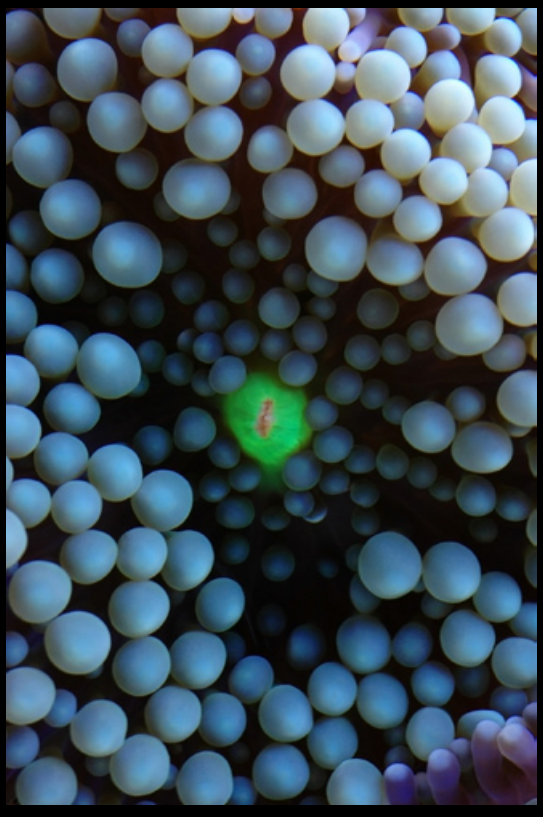
The above chart only provides a rough guide. Consulting an experienced hobbyist and/or aquarium professional is recommended. Often times, finding the right filtration for a deka pico system is a process of trial-and error. Obviously. factors to consider are primarily livestock and bio-load.

Lighting

Choice of lighting can be tricky for small reef aquariums. If you plan to keep stony corals, you'll need the same intensity of lighting you would need in any other system. Unfortunately, that level of lighting can literally "cook" a shallow aquarium. In some situations, natural sunlight is good - but be wary if you're in hot areas or the light is particularly intense. High quality LED lighting is probably the best choice as it minimises heat output.

Substrate

It's probably best not to have too much sand in any reef aquarium under 40g. In order for a sand bed to be "functional" (i.e. contribute to the biological filtration of the system), it has to be of a certain size. Otherwise, the sand will only be



a beautiful blue Ricordia species.

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decorative. If you want to use sand for aesthetic reasons, use as little as possible. Too much idle sand can trap waste and cause your system to "spoil" (in both a literal and figurative sense). Unless you plan on keeping a fish that requires sand in which to bury itself, you don't really need any kind of fine substrate in smaller reef systems. Usually, the best substrate for smaller reef aquariums is simply a few pieces of aged live rock, surrounded by some rubble or a thin layer of crushed coral.

Water Flow

Water flow is relatively easy to create in a small system. More often, the problem is keeping that water flow under control. An average size power head is going to turn a 40 litre (10 gallon) aquarium into a Jaccuzi. Fortunately, several companies have started selling smaller power heads designed for "nano" reef aquariums. Another option is to use an air pump, or several air pumps.

Livestock

The smaller the reef aquarium the fewer options you'll have for livestock. There's virtually no ornamental marine fish which can be kept well in a 5g system. However, if you want to keep a 5g reef tank, you

the Sexy Shrimp (*Thor amboinensis*) is one of the smallest shrimp available and is ideal for the nano reef.
Photo by Budi Lukman.

might consider a small shrimp, crab, or other hardy invert. Don't be fooled into thinking that if a marine fish is small in size that means it can be kept in a small aquarium. For example, "mandarin gobies" and other dragonets, though relatively small fish, usually only survive in large systems (due to their specific feeding requirements). Practically speaking, there's no marine fish you should try to keep in any system less than 5g. For systems 10g and larger, some options might include true and false percula, Banggai Cardinals, Pajama Cardinals, Clown Gobies, *Pseudochromis* and maybe some smaller species of damsels. The number of fish should be kept to a minimum.

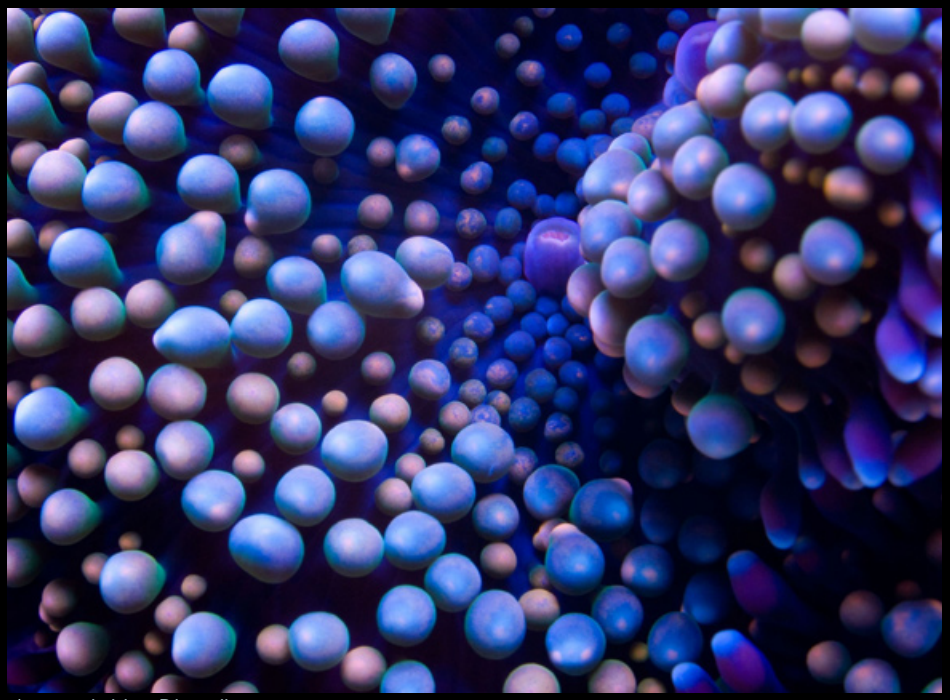
Fortunately, there are many more options for corals in small reef systems. The biggest problem corals create in small systems is their propensity for chemical warfare. Most all soft corals, to some extent or another, produce chemicals which, in a small system, can make water conditions intolerable for their tank-mates. This is why you should never try to keep an ornamental anemone in a "nano" reef tank.

The best corals for small systems are zoanthids, colonial large-polyed corals (such as favids, favites, acanthastrea, etc.). Sometimes you can keep hardier varieties of small-polyp corals in a small reef system (assuming all the requirements for light, water flow, etc. are met). Just keep in mind that the smaller the system, the fewer colonies of coral will ultimately survive. For example, if you put 5 different corals in a 10g aquarium, those five will likely battle with each other until, after a few months, only maybe two survive. "Turf" wars are always more brutal where "turf" is limited. The same goes with fish and inverts.

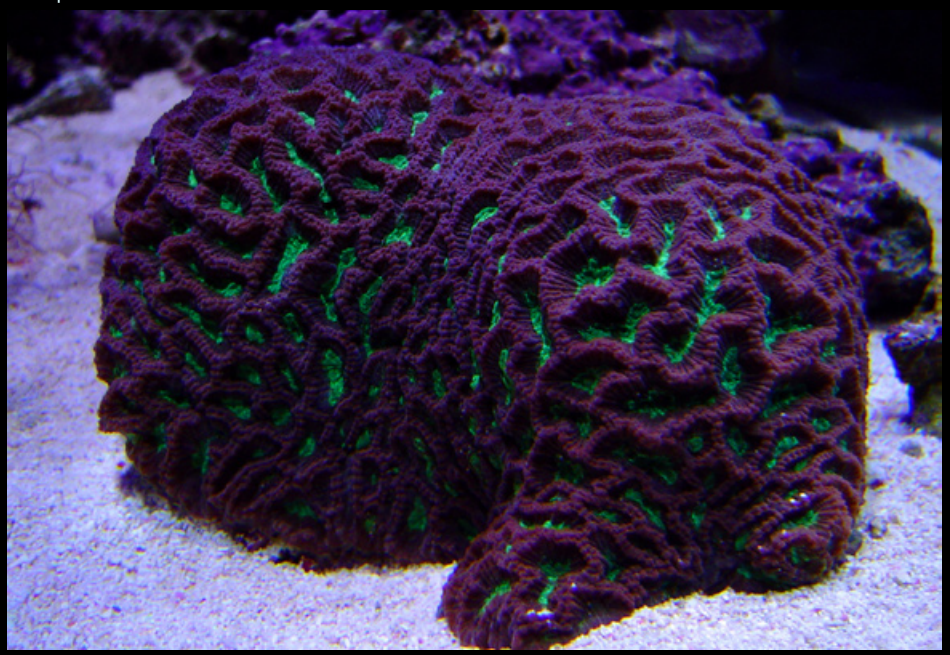
Coral Limorphs
("Mushroom" corals and Ricordia)

Corallimorphs, in some ways, are ideal corals for smaller reef aquariums. I've had colonies of mushroom corals which seemed virtually indestructible. Many

Mushrooms are excellent choices for the nano reef. Photo by Budi Lukman



A superb blue Ricordia



Favites are ideal for smaller tanks. Photo by Bob Mars.
Courtesy: http://www.freeimageslive.co.uk/

species of Corallimorph can adapt to a wide range of light intensities and system conditions. Not all Corallimorphs are this resilient. For example, Ricordia can be a somewhat finicky coral in large systems. However, Ricordia might actually be well suited for life in a deka pico (especially if they don't have to share the system with other types of corals). Unlike most aquarium corals, Ricordia prefer gentle water flow and more moderate lighting. Ricordia also tend to stay small in size, compared to some species of "mushroom" corals which can get to be the size of dinner plates. To keep Ricordia, or any Corallimorph, you'll still need a quality light source and good water flow, but these corals might be more forgiving than other types of corals. One warning; some species and colonies of Coralimorphs can be toxic to stony corals, especially large-polyp stony corals.

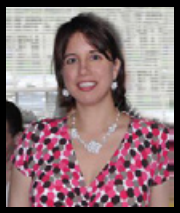
Photo by Budi Lukman

Closing remarks

Beginner aquarists often make the mistake of assuming that a smaller aquarium is easier to maintain than a large one. In some ways that might be true. However, in general, and especially when it comes to reef systems, smaller is definitely not easier. Before you try to keep a "nano" reef aquarium, you should probably be able to successfully maintain a more normal sized system. As with any marine aquarium system, careful and thoughtful planning yield a greater chance of success. Happy reef keeping.

Acknowledgements

The first page of this article features an amazing photo by John Ciotti. Redfish Magazine would like to thank John for permission to publish his amazing photo and recommends readers visit John's fantastic photostream: http://www.flickr.com/photos/jciotti/



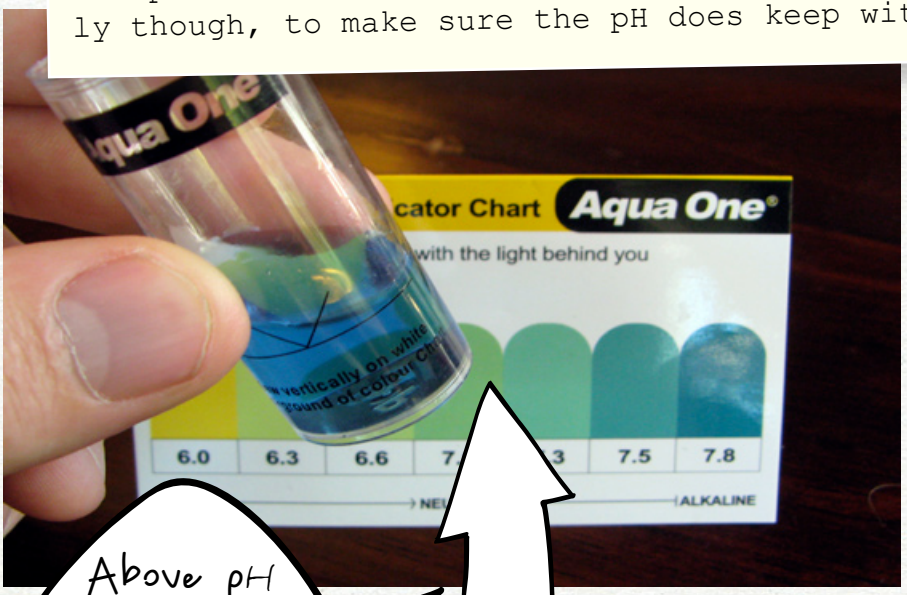
Sara Allyn Mavinkurve is a WetWebMedia crew member who has authored a range of articles on corals and marine aquariums for international and US fishkeeping magazines. She's a special guest at the Marine Aquariums of South Africa. When she's not writing about fish, Sara is an attorney who SCUBA dives in her ever-shrinking amounts of free-time.

Aquarium Basics

Part 2: Adding fish, cycling & scaling up

This is the second part of a three part series which covers the setting up of a tropical freshwater aquarium. In the first part we placed the aquarium in the correct spot, set up the filter and heater, added our water and decorated the tank. Now we're up to the exciting part – adding the fish! It's important to get this part right – a newly set up aquarium is not a stable environment and there is a risk of killing the new fish if things aren't done the right way.

Before we put any fish in the aquarium, we tested the pH of our water to see if it's in the right range. The ideal pH range for most popular tropical fish is 6.5-7.5. Keeping the pH of the water around 7.0 (neutral) is good for just about any of the hardy species of tropical fish. Values of pH below 7.0 mean the water is acidic, values above 7.0 represent alkaline water. Our water came out at 7.5 – it's at the upper end of our ideal range but we're not going to try to change it. We expect that over time, as waste products are broken down by our filter, the pH is likely to drop a little. We'll be testing the water regularly though, to make sure the pH does keep within the right range.



It's better to choose fish for your local water chemistry than to adjust the water chemistry to match the fish!

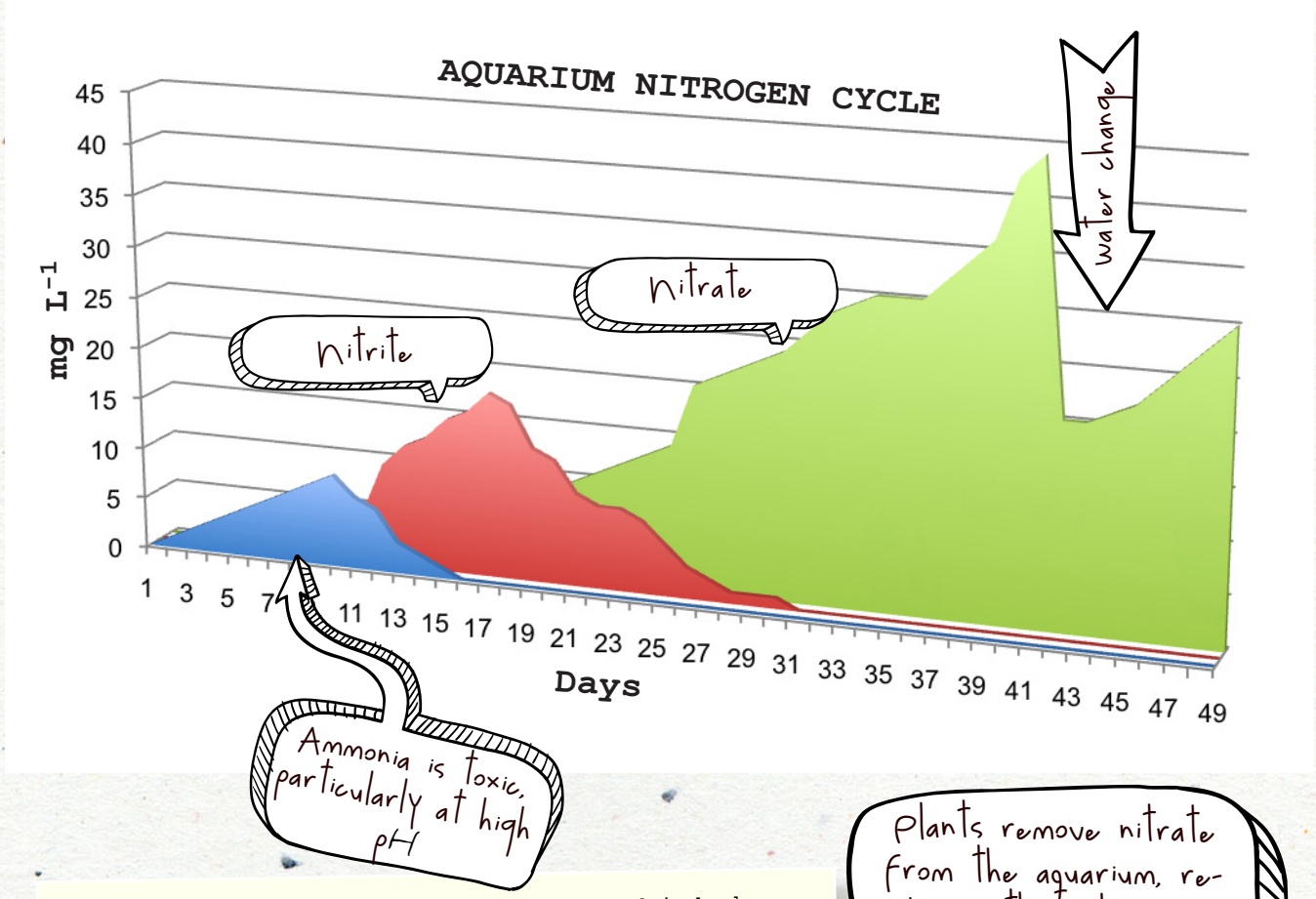
Above pH 7, water is more alkaline

pH: 7

Some fish, like this cichlid, prefer alkaline water (pH 8+)

Below pH 7, water is more acidic

Tetras prefer slightly acidic water!



The aquarium is full of water which has been dechlorinated, the pH is fine and the temperature of the water is 24 degrees C so we're nearly ready to add the fish. However our filter, whilst it may have water running through it, is not actually functioning. A brand new filter has no bacteria in it and it is the bacteria that will remove the toxic waste that builds up in the water as uneaten food and fish faeces break down. The process of growing a crop of these good bacteria in the filter is known as "cycling". Waste from the fish first breaks down to ammonia (shown above in blue), which is highly toxic to fish. Small amounts of ammonia in the water can kill fish. Bacteria in the filter and gravel of the aquarium use the ammonia as a food source and turn it into nitrite (red). Nitrite is less toxic to fish than ammonia but still capable of killing fish when it is present in relatively small amounts. Fortunately there are other bacteria in the filter that will feed of the nitrite, turning it into nitrate (green). Nitrate is far less harmful to fish than ammonia and nitrite and it is only usually a threat to most sensitive

fish. For most tropical freshwater fish, keep your nitrates under 40 mg L^{-1}. Over time, nitrate will build up in the water, but we'll be removing it with regular water changes, to keep it from becoming too concentrated.

There are many ways to "cycle" an aquarium and the following will describe just one, easy way. We went to our local aquarium store and asked the owner of the store if we could have a little bit of material from one of their filters (like a piece of filter wool, or some ceramic noodles). Since their filters are well established, the material in the filters contains a huge population of active, living bacteria. We came home with a small bag of bacteria-laden ceramic noodles and placed them straight into our filter. This means we basically have a nice little "starter culture" of bacteria in our filter, to get things going. If you do this type of cycling yourself, make sure that you don't waste time getting the seeded filter material into your own filter at home. The bacteria in the filter material will die if allowed to dry out, or sit around too long before being placed into the filter.

Now that we have some bacteria in our filter, we need to grow them so that they form a big enough colony in the filter to sustain a tank full of fish. The water flow in the filter is giving the bacteria the oxygen they need to survive, but they also want food! So now it really is time to put our very first fish in the aquarium. Waste from the fish will provide the bacteria with food and the size of the colony will increase. There's only a small colony of bacteria in the filter at the moment, so we'll only put a few fish in at first. If we were to put too many fish in too early, the small colony of bacteria would not be able to remove ammonia and nitrite from the water fast enough to keep the fish healthy. It's a delicate balance and it's quite possible that the first fish that go in may experience a brief "ammonia spike" in the water if our bacteria can't keep up immediately. Because of this, we're choosing hardy fish which can tolerate brief periods of less-than-ideal water quality.

First to go in the aquarium are 5 small Odessa Barbs. Having brought them home we float the fish in their bag in our aquarium for 20 minutes so that the tempera-

Our first fish!

Odessa barbs are peaceful & hardy!

Paper Texture by Enrique Flouret

ture in the bag becomes the same as that in our aquarium. This will prevent the fish experiencing the shock of a difference in temperature when they're released into the water. Having released them, all the fish go straight to the back of the tank and hide. This is quite normal behaviour - their new environment is unfamiliar and there's only 5 small fish in the tank, so they don't feel safe enough to come out. We let them settle, being careful not to spook them too much over the next few days as they get used to everything. As for feeding them, we're being careful to feed only a very, very small amount of food once a day. If we put too much food in we may cause a build-up of more ammonia than the filter bacteria can cope with, which may then harm the fish.

Don't overfeed!

Feed only small amounts of food, once per day during cycling. Be sure to monitor ammonia and nitrite levels before adding new fish!

Harlequins are fantastic, hardy fish, though they need to be added in a small school!

One week later, the Odessa Barbs are healthy and eating well. The pH is still 7.5 and ammonia and nitrite tests are at zero. Since things are going well, we can add a few more fish. We release 8 small Harlequin Rasboras into the tank. These hardy fish are schooling, mid-water swimmers. Now that there's more fish in the tank the Odessa Barbs are happy to come out of hiding and join the Rasboras, so our aquarium is looking a lot more lively. We've just increased the load on our filter bacteria, so we still need to be careful with feeding whilst the colony of bacteria catch up.

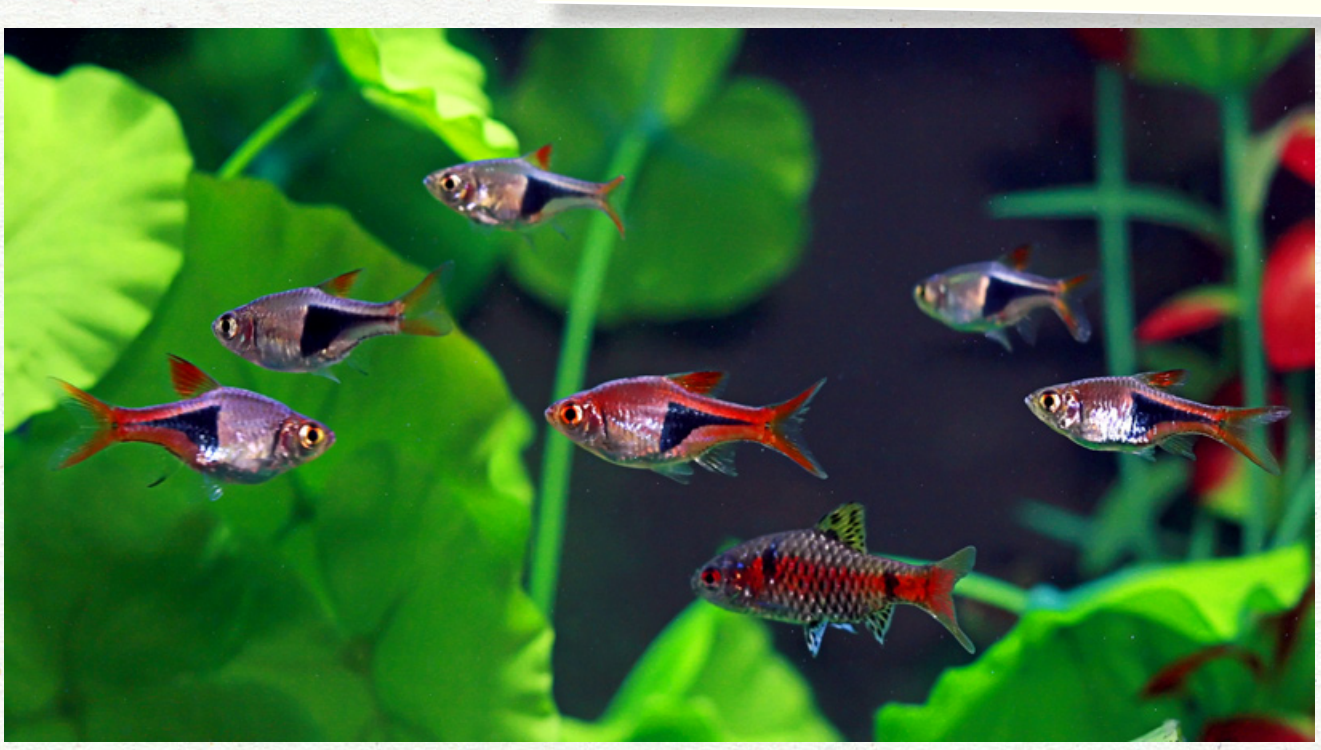
Another week later we test our water. With the pH still at 7.5 and ammonia and nitrite at zero it's OK to add more fish. This time we buy 4 *Corydoras sterbai*. Corydoras are an excellent choice for most tropical freshwater tanks. They're very hardy and they'll occupy the lower strata of the aquarium where

Paper Texture by Enrique Flouret

Like the harlequins, Corys should be added in small groups! They don't do well alone!

they're very handy at cleaning up any food which is not eaten by the mid-water fish. We're still being careful to feed only as much food as the fish can eat in about 30 seconds. Again, we wait a week before adding our last inhabitants – two Bristlenose Catfish, which will clean up the algae that is beginning to grow on the aquarium glass and some of the leaves of our plants.

So here we are, four weeks after the initial setting up of our aquarium. The tank looks great, it's full of activity and wonderful to watch. Testing our water again, we have a pH of 7.5, ammonia and nitrite at zero and nitrate at 10ppm. Up until now we haven't changed any water – this is done to remove nitrate and it takes several weeks before nitrate builds up to any sort of significant level, but that is now starting to occur. We're also getting algae growth on the glass so we'll need to deal with that. The time has come to get into a routine of maintenance for the aquarium, in order to keep the system healthy and looking good. We'll deal with aquarium maintenance in the next, final article in this series, in next month's issue of Redfish Magazine.



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